

Y DEPARTMENT

of Pennsylvania State College

Storage
Fertilizer

THE HAWAIIAN FORESTER AND AGRICULTURIST

AUGUST, 1916

CONTENTS

	PAGE
Editorial.....	281
Two New Rules Adopted	282
The Round Top Forest Reserve.....	282
Division of Entomology, Reorganization of.....	283
" " " " Report for fiscal year	286
" " " " July	302
" " " " of D. T. Fullaway on parasitism.....	303
Division of Animal Industry, Report for fiscal year.....	288
" " " " July	307
Division of Forestry, Report for fiscal year	284
" " " " Report for July	296
Division of Hydrography, Report for fiscal year.....	291
" " " " Report for July	313
Division of Plant Inspection, Report for July.....	299
By Authority—Proclamation of Forest Reserve (Round Top).....	314
By Authority—Rule IX (hog cholera, etc.)	315
—Amendment to Rule XVIII (pineapple quar- antine)	317

VOL. XIII.

PRICE, TEN CENTS

NO. 8

FORESTRY DEPARTMENT

Pennsylvania State College

Alexander & Baldwin, Limited

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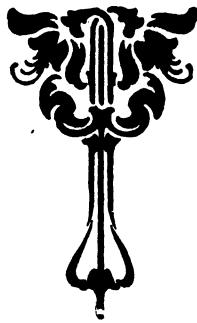
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The Hawaiian Forester and Agriculturist

A Monthly Magazine of Forestry,
Entomology, Animal Industry,
Hydrography and Agriculture.

Issued under the direction of the Board
of Commissioners of Agriculture
and Forestry, Territory of Hawaii.



Address all communications to
DANIEL LOGAN
Editor "THE FORESTER"
P. O. Box 366, Honolulu, T. H.

For business relating to subscriptions
or advertising, address
HAWAIIAN GAZETTE CO., LTD.,
Publishers, Honolulu, T. H.

Price 10c. per copy; \$1.00 a year; Foreign, \$1.25
Entered as second-class matter at the Post Office at Honolulu, Hawaii.

Board of Agriculture and Forestry

DIVISION OF FORESTRY.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 207, Honolulu, Hawaii.

C. S. JUDD,
Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box, specimens may be mailed by parcels post. When specimens are not accompanied by letter always write your name and address in the upper left-hand corner of the package. Address all communications, SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.

EDW. M. EHRHORN,
Superintendent of Entomology.

PUBLICATIONS FOR DISTRIBUTION.

The Board of Commissioners issues for general distribution to persons in the Territory, annual reports, bulletins, circulars, copies of its rules and regulations, and other occasional papers, which may be had, free, upon application.

A complete list of the publications of the Board available for distribution (together with the titles of certain issues now out of print) is to be found on the cover of the last biennial report.

Applications for publications should be addressed to the Mailing Clerk, P. O. Box 207, Honolulu, Hawaii.

DIVISION OF HYDROGRAPHY.

Rooms 17-22 Kapiolani Bldg. Tel. No. 3662.

The Division of Hydrography has on hand free publications relative to the water resources of the Hawaiian Islands. These publications furnish detailed data as to daily, monthly, mean, maximum, and minimum run-off of streams and ditches, and also cuts and maps pertaining to the different islands. These publications will be mailed free of charge on request.

The records and maps of this Division are available for inspection by any one who desires information relative to water resources, topography, etc. Blue print copies of hydrographic data relative to any stream, ditch, spring, etc., which may be under observation by this Division will be mailed free of charge on request.

G. K. LARRISON,
Superintendent of Hydrography.

THE HAWAIIAN FORESTER AND AGRICULTURIST

VOL. XIII.

HONOLULU, AUGUST, 1916.

No. 8

The reports of the superintendents of the four divisions of the Board, for the fiscal year ended June 30, 1916, which appear in this issue, tell of the continued good work being done to aid forestry and agriculture and allied industries in the Territory. Special attention is called to the continuation of the work of forest protection by fencing forest boundaries and the appointment of additional forest rangers; the continued rigid inspection of imports of vegetable matter to prevent further injurious insects from reaching these shores, the breeding of beneficial parasites on pests established here and the introduction of a new parasite on the melon fly; the continued campaign to eradicate bovine tuberculosis and the practical application of a cure for sorehead on chickens; and the progress made in obtaining measurements of government water which will increase the amount of revenue coming to the Territory from water in the future.

The report of Field Entomologist D. T. Fullaway on his successful expedition to India for a parasite on the melon fly, printed herewith, will be of interest to those who are eager to see the expansion of secondary agriculture in the islands. Mr. Fullaway has been successful in the multiplication of the parasite and during July liberated a total of 2,159 on Oahu, Hawaii, Molokai, Maui and Hawaii.

The arrival in July of parasites on the corn leaf hopper, brought by Mr. Herbert Osborn of the Sugar Planters' Association, and their successful propagation and distribution, will also be a great benefit to the corn planter and small farmer in the Territory.

The further experiment of growing timber trees from other tropical countries on the higher slopes of Mauna Kea should throw some light on the question of whether it will be possible to produce locally timber suited to the needs of these islands.

The use of the new sorehead vaccine has resulted in preventing the loss of a great many birds to poultry raisers throughout the Territory.

The case of forage poisoning of hogs on Maui, reported by the Assistant Territorial Veterinarian, shows that it is poor economy and dangerous to feed to hogs grain which has caused the death of horses and mules.

Two New Rules Adopted

The Board of Commissioners of Agriculture and Forestry has recently adopted and the Governor has approved the two new rules printed in this issue.

Rule IX of the Division of Animal Industry, approved by the Governor on August 8, 1916, concerns hog cholera and other diseases of swine and was found necessary in order to handle more adequately the suppression of hog cholera epidemics in the Territory. Before adoption the rule was sent to all hog raisers in the islands and was received with favor.

Rule XVIII of the Division of Entomology, approved by the Governor on September 2, 1916, provides for a further amendment of the original rule to allow pineapple fruit only to be shipped from Honolulu to the Island of Hawaii. The original rule prevented pineapples, pineapple plants, and suckers from being shipped from Kauai to other islands and was amended to prevent the same from being shipped also from Oahu, in order to prevent the spread of a fungus disease discovered on pineapples on those two islands. Of late, however, this fungus has not been active and on the advice of experts the Board decided that clean pineapple fruit could safely be shipped from Honolulu to Hawaii, where it is scarce and is in great demand especially by tourists visiting the volcano of Kilauea.

The Round Top Forest Reserve

On August 10, 1916, the public hearing on the proposed Round Top Forest Reserve, Oahu, was held and there being no objections raised, the area was set apart as a forest reserve by proclamation of the Governor on the same day.

This new reserve, which has a net area of 115 acres, includes the government land on Round Top above the new Round Top road and extends to the northeast as far as the privately owned land near Sugar Loaf. It is bounded by the Honolulu Watershed Forest Reserve on the Makiki side to the southwest, by vacant public land on the Manoa side to the northeast, and by the Makiki lots on the makai side toward Honolulu. The new Round Top road winds through the mauka part of the reserve and makes it very accessible to those who visit it in vehicles. The U. S. Military Reservation of 3.9 acres near the top of Round

Top is excluded from the reserve by the proclamation which appears in the By Authority pages of this issue.

It is planned to make this a natural park-like area, improving the appearance of the land by judicious tree planting but not to obscure in any way the wonderful views which are disclosed from many parts of the reserve. Paths will be built to the various view points to make them accessible to pedestrians and it is planned to build a shelter for picnickers from private funds which have been promised.

Reorganization of the Division of Entomology

On June 30, 1916, the Board decided upon a reorganization of the Division of Entomology and voted to put it into effect as far as possible. To make this reorganization complete, the necessary change in titles must be sanctioned by the next session of the legislature by making appropriate changes in the law. In the meantime the reorganization is in operation so far as practical work goes.

The old division is separated into two divisions—the Division of Plant Inspection with Mr. E. M. Ehrhorn in charge as "Chief Plant Inspector" and the Division of Entomology and Parasitology with Mr. D. T. Fullaway in charge as "Entomologist."

The work of these two divisions is quite distinct—the first handling the inspection of all imports of vegetable matter liable to carry insects and the enforcement of the plant quarantine and inspection regulations; the second handling the investigation work of entomology, the introduction, breeding and distribution of parasites, and remedies for local insect pests. At the same time each division is to coöperate with and assist the other division in the best interests of the Territory.

REPORT OF THE

Division of Forestry

OF THE BOARD OF AGRICULTURE AND FORESTRY
FOR THE FISCAL YEAR ENDED JUNE 30, 1916.

The primary object of adopting modern methods of practical forestry in these islands is to foster and increase the source of water supply. This is done in two ways, by forest protection and forest extension and, as in the past, the main efforts of the Division of Forestry during the year have been along these lines. The work of forest protection has consisted of constructing new fences and repairing existing fences on forest reserve boundaries to keep wandering stock from damaging our susceptible native forests; of improving the administration and protection of the forest reserves by establishing rules and regulations and by maintaining and increasing the forest ranger force to see that these are carried out; by the continuing of the forest fire service to detect and extinguish grass and forest fires; and by placing more forest land in the general forest reserve system.

Greater protection of the forests on government lands within the reserves has been secured by the construction during the year of 5.76 miles of new fences and the repair of 10.41 miles of existing fences on forest reserve boundaries. Stretches of new fences were constructed where they were most needed at Ana-hola and Moloaa, on Kauai, at 29 Miles and 24 Miles along the Volcano Road, Olaa, on Hawaii, and at Lualualei on Oahu. Existing fences on forest reserve boundaries at Lualualei and Pupukea on Oahu, and at Wailua and Kapaa on Kauai, were repaired and strengthened. In other words, during the year a total of 16.17 miles of forest reserve boundaries were effectively made stock-proof.

Rule II of this Division received the approval of the Governor in April and at once went into effect. This rule, which aims at the better administration and protection of government lands within the forest reserves forbids, among other things, the destruction of property and pollution of streams and the unauthorized taking of material, grazing of stock, hunting, or use of land within the reserves, and forms a working basis for forest administration which, up to this time, this Division had lacked. It is based on the regulations of the U. S. Forest Service which have been tried out for many years on the 150 million acres of National Forest lands all over the United States and have proved satisfactory. During the year two additional forest rangers have been appointed for the better administration and protection of the forest reserves and they have done effective work. There are now three rangers on Oahu and one on Kauai. Another has

just been appointed for Hawaii and with the early appointment of a forest ranger for Maui, the forest reserve field force will be up to full strength.

Forest protection has been further effected by the prompt extinguishment of the seven grass fires which occurred during the year. Only one of these, at Schofield Barracks, Oahu, reached the native forest and did some damage before it was put out.

Considerable work, of a preliminary nature, toward the inclusion of additional forest land in the general reserve system was accomplished during the year but only one new reserve of 15 acres in Manoa Valley, Oahu, was actually created by proclamation of the Governor. The Territory now has 38 forest reserves on the six main islands which aggregate in area 798,229 acres. Of these, 546,237 acres consist of government land.

Forest extension during the year has consisted of the actual work of tree planting by the Division and the encouragement of planting on private waste lands by the raising and distribution at cost of tree seedlings. The planting of native trees on the Honolulu watershed in the Makiki Valleys and near Sugar Loaf was continued by the setting out of approximately 3,000 koa and kukui trees. In less than three years, a total of 15,885 trees have been planted in this region and cared for and to date 82 acres have thus been successfully reforested with the same species of native trees which originally occupied the land. Approximately 12,000 trees of various species have also been planted by this Division on the Papapaholahola Spring and Kealia Reserves on Kauai.

Tree planting by private parties and this Division combined during the last calendar year resulted in the setting out of a total of 874,489 trees. It is noteworthy that the object of 53% of this planting was fuel production and 52% of the trees planted consisted of Swamp Mahogany, a quick growing and ratooming species of eucalyptus. A study of the wood fuel situation in the Territory has been begun with the object in view of reducing the price of this commodity.

The total number of trees raised by this Division and distributed to tree planters during the last calendar year amounted to 247,432. The fact that over three times this number were planted during the same period shows that interest in tree planting is now so permanent that many private nurseries for this purpose have been established. Arbor Day was, as usual, celebrated in November and 21,248 trees were sent out from the government nurseries for planting on this worthy day. This number has been exceeded only on two previous Arbor Days and on this last occasion 1,350 school children called at the government nursery in Honolulu and each took one tree away for planting.

In conclusion, it may be said that much progress has been made

during the year in forest protection and extension, the two requisites for the maintenance of a sustained and sufficient water supply.

C. S. JUDD,
Superintendent of Forestry.

Honolulu, Hawaii, July 5, 1916.

REPORT OF THE

Division of Entomology

OF THE BOARD OF AGRICULTURE AND FORESTRY
FOR THE FISCAL YEAR ENDED JUNE 30, 1916.

The work performed by the Superintendent and his assistants, of the Division of Entomology, during the fiscal year of July 1, 1915, to June 30, 1916, consisted of the following:

1. The inspection of all fruits, vegetables and plants coming into the Territory from foreign countries and the mainland as a preventive against introducing new pests and plant diseases so injurious to the various agricultural industries in other countries.
2. The inspection of all fruits, vegetables and plants that are shipped from the port of Honolulu to the ports of all the other islands. The purpose of this inspection is to prevent any pest accidentally introduced on Oahu, of which Honolulu is the port of entry, from being carried to the other islands.
3. The collecting, breeding and distribution of parasites of the various pests now known to trouble agricultural industries. Especially has this been done during the last period for the fruit-fly and melon-fly, so detrimental to the production of good fruit, melons, squash, cucumbers and other vegetables. Also the breeding and distribution of parasites of the various dung-flies, horn, house and stable-fly.
4. The dissemination of such advice and general information as was possible for the control of insect pests and plant diseases so troublesome to the grower.

INSPECTION.

Foreign and Mainland.

The inspection of horticultural products, such as fruits, vegetables, plants and seeds, has been the principal work of the Superintendent of Entomology. Owing to the opening of the Panama Canal, the increase of shipping to the port of Honolulu has been quite noticeable and although many vessels arriving here after passing through the canal have no cargo for the islands,

yet they require our attention upon arrival and during their stay in port.

During the fiscal period there arrived at the ports of Honolulu and Hilo 634 vessels. Of this number 323 vessels carried matter subject to inspection by this Division which consisted of 300,613 packages of fruit and vegetables and 6,008 packages of plants and seeds. Of these shipments 1,584 packages were fumigated for injurious insects found upon them or as a precautionary measure for finding traces of injurious insects. Six hundred forty-eight packages were destroyed by burning on account of being infested with insect pests which fumigation would not reach nor kill, or being entirely prohibited from entry into the Territory, and 41 packages were returned to the shipper on account of coming by mail from a foreign country which is prohibited under the rules of the Federal Horticultural Board. Fruit and vegetable shipments were returned to shipper on account of being too badly infested with pests or fungi to allow their dissemination in the markets and the country.

The prohibition of plant and seed shipments through the mails from foreign countries tends to diminish the chances of accidental introduction of serious pests.

All fruits and vegetables arriving from the Pacific Coast are used for local consumption and owing to the rigid inspection and standardization of these conditions there, these shipments present a very clean and improved condition when compared with those of a few years ago. A few of the more important fruit and vegetable shipments consisted of:

Cabbages	2,735	crates
Lemons	6,951	boxes
Onions	30,999	crates
Celery	2,450	crates
Oranges	51,621	boxes
Potatoes	111,434	bags

Some of these commodities have of late been grown in larger quantities in the islands and there seems no reason why this should not be encouraged.

Inter-Island Inspection.

The inspection of all fruits, vegetables and plants leaving Honolulu for ports on the other islands has continued on the same lines as last year. During the fiscal year 732 steamers were attended to and 9,087 packages of plants, fruits and vegetables have been inspected. Of this number 321 packages were refused shipment either on account of being infested with pests or of having

undesirable soil attached to the roots, which was liable to carry some fungus disease.

PARASITIC WORK.

During the greater part of the fiscal period the work of breeding and distributing the various parasites for the fruitfly, horn, house and stable flies has been under the direct supervision of the Entomologist on account of the absence of Mr. D. T. Fullaway, who went to India, Java and the Philippine Islands in search of a parasite for the melon-fly. Our chief aim has been to keep alive all the various parasites which were brought here by the first and second expeditions to Africa. There have been bred and liberated in various districts on all of the main islands of the group a total of 239,012 parasites of which 186,512 were for the fruit-fly and 52,500 for the various dung-flies, as the horn, house and stable-fly.

From the materials collected in the field we have been able to rear all of the introduced parasites of both the fruit-fly and dung-flies except two species, *Dirhinius giffardii* and *Galesus silvestrii* parasites on the pupa of fruit-fly, despite the fact that many thousands were liberated during the last three years.

The usual dissemination of advice regarding pests and diseases of crops or of plants in door-yards was given and much correspondence attended to.

E. M. EHRHORN,
Superintendent of Entomology.
Honolulu, Hawaii, July 3, 1916.

REPORT OF THE

Division of Animal Industry

OF THE BOARD OF AGRICULTURE AND FORESTRY
FOR THE FISCAL YEAR ENDED JUNE 30, 1916.

LIVE STOCK CONDITIONS IN GENERAL.

The past year has probably been unprecedent in so far as prosperity of the live stock and stock breeding businesses are concerned. A few years ago the term live stock or ranching business would have covered everything here to be considered, but more recently the leading live stock raisers have realized that pure bred sires and dams, of whatsoever class of live stock—horses, cattle, sheep or swine—do not necessarily have to be imported, but that they can be produced here equally as well, if not better, than in any other country. As Kentucky, some decades ago, found the blue grass region of that state equal in muscle, bone

and beef-producing properties to any region in the Old Country, so has Hawaii's leading stock raisers realized that once a good foundation was introduced here, no difficulty in maintaining or improving the same need be looked for, and that the exorbitant cost of constantly importing breeding stock might be, if not entirely eliminated, at least confined to the necessity of avoiding inbreeding.

It may, therefore, be claimed, that since the leading ranch owners have emancipated themselves from the time honored, and until quite recently accepted, happy-go-lucky methods of feeding up their pasture crops as climatic conditions provided them, planting little or nothing and making neither hay nor silage, reaction has set in with a will. Pastures have been fenced and seeded, hay and other forage crops conserved, and above all, the value of blood, breeding and pedigree in live stock sent to market has accentuated the necessity of having the best stallions, bulls, rams and boars that money can buy, as their offspring not alone mature quicker, but bring vastly greater returns to the shipper than inferior classes of the same animals.

Under these conditions the islands are becoming more and more self-supplying in so far as meat food products are concerned, while dairy and poultry products still remain far behind. It is more than doubtful whether butter and cheese can ever be produced here in quantities anywhere near sufficient to supply the demand which of late years has been so greatly increased by the large military depots established here. The poultry industry on the other hand has received new life through the discovery and practical application of a simple method whereby the very destructive disease known as sorehead or chicken pox can be both cured and prevented. This disease has been responsible for the almost cessation of poultry raising on a large scale and has caused the prices on fresh island eggs and poultry to soar to respectively, 40¢ to 75¢ per dozen for eggs and 35¢ to 45¢ per pound of live chickens and turkeys. While this disease cannot be said to be the exclusive cause of these conditions, it is generally conceded that ninety per cent. of all chicks hatched after June 1st every year die from it, and that from 25 to 50 per cent. of the earlier hatchings become affected with varying percentages of mortality.

With vaccination however, as it has been practiced here on several thousand chickens, turkeys and squabs, the conclusion is justified that this great loss can be reduced to ten or perhaps five per cent. and evidence is already forthcoming that the local production of eggs and poultry will at least double during the coming year.

Another branch of the live stock industry which has taken a great step forward is hog raising. The large quantities of mess offal (swill) which became available from the numerous military

establishments on the Island of Oahu, provided food for several thousand hogs, and while there is considerable risk of disease resulting from its use, the timely application of hog cholera serum will to a great extent offset the danger of infectious diseases. On the other islands hog raising has likewise increased greatly, especially with the growing and conservation of proper feed crops and the time seems to be near when the Territory will supply its own demand for, not alone fresh pork, but for cured hog products, as ham and bacon.

As in the last preceding years, the military authorities have purchased quite a number of island-raised horses for the use of the cavalry and artillery, and it is doubtful whether better polo horses are bred anywhere in the world than here. The world famous "Carry the News," for which \$15,000 was offered in New York, was raised on the Parker Ranch, the sire being a thoroughbred stallion, "Eastertide," while the dam may have been any of forty or fifty mares served by him that season. It consequently stands to reason that there are many more good horses on this ranch, even though they may not all become the best polo performers. The Parker Ranch also produces hundreds of Percheron sired heavy draft horses which are in great demand for plantation work and sell readily at three years old for \$225 to \$250 per head.

The question of horse supply in case of military emergencies must, therefore, be said to be settled, while the question of feed under the same circumstances remains unsolved. That immense quantities of feed go to waste here in the form of cane tops and molasses, is undisputed, and it is therefore worthy of note that the Hawaiian Sugar Planters' Association, through its experiment station, has now taken up the question of how these products may be utilized with a view to minimizing the immense importations of feed from the Mainland which arrive here by every available steamer.

In regard to live stock diseases the past year has been unprecedentedly favorable to the stock raisers.

Rabies and foot and mouth diseases have remained excluded and neither glanders nor hog cholera have reached us with imported stock. A few scattered cases of glanders appeared in the only district which has remained unprovided with an official veterinarian, but the want has now been filled.

BOVINE TUBERCULOSIS.

The suppression of bovine tuberculosis has been continued on the Island of Oahu and has, under authority of a new sanitary code promulgated by the Territorial Board of Health, been extended to the other islands. Results show considerably less infection on Hawaii and Maui than on either Oahu or Kauai. The

total remaining infection may be conservatively estimated as below two per cent. and the ultimate eradication may be considered assured before long.

VICTOR A. NORGAARD,
Territorial Veterinarian.

Honolulu, Hawaii, July 3, 1916.

REPORT OF THE

Division of Hydrography

FOR THE FISCAL YEAR ENDED JUNE 30, 1916.

The following report of operations of the Division of Hydrography is submitted:

SCOPE OF WORK.

In addition to the general investigation of all surface water resources of the Territory, including privately owned as well as water resources owned by the Territory, which has been carried on in coöperation with the U. S. Geological Survey as in the past, the last fiscal year has been notable for the large portion of time and effort given to the investigation of waters owned by the Territory.

Many water licenses and land leases involving comparatively large supplies of Government water, will terminate within the next few years, and equitable renewals or new licenses or leases are very much dependent on the total quantities and seasonal variations of these quantities of the water available under these licenses and leases.

The years of patient effort which have been expended by this organization in collecting hydrometric data, have furnished very interesting and fairly reliable data when these are compared with the annual fees and rentals paid under existing licenses and leases. These data are demonstrating the fallacy of the previous methods used in fixing annual water and land rentals under old licenses and leases, and, although the available records are still very meagre and not what are desired, these are sufficient to show the value of the work being done in this line, and the necessity for continuing the work with a more comprehensive and more intensive scope in the future.

Several of the licensees and lessees of Territorial waters and lands have foreseen the value of keeping reliable records of the available surface water resources during the past decade. The methods used have not always been consistent with the funds ex-

pended, but the records obtained (and freely furnished on request) have proved very valuable when compared and used in conjunction with data obtained by this Division.

Geographically the work has been extended very little and has been limited to the islands of Kauai, Oahu, and Maui,—except for a few rainfall measurement stations which have been established on Molokai and Hawaii.

From the viewpoint of intensity and efficiency, the work on these first three islands has progressed tremendously.

FLOODS.

The year has been an exceptional one in regard to heavy rainfall, storms, and floods. The months of December and January were notable for four or five heavy Kona storms which were accompanied by the heaviest rainfall recorded since the U. S. Weather Bureau was established in the Territory. These storms resulted in the loss of more than a score of lives on Maui and several deaths on the islands of Kauai and Hawaii. Damage to crops and structures to the extent of hundreds of thousands of dollars also resulted from these storms. A great amount of flood flow data were obtained by this division which will be very valuable in future estimates for bridge, culvert, and flume designs.

LEGAL WORK.

A large amount of hydrometric and other scientific work was done in connection with the Waiakoloa water case, which was tried at Waimea, Hawaii, and Honolulu in July, August, and September, in coöperation with the Attorney General's Department.

HONOLULU WATER SUPPLY.

The surface stream and ditch measurement work, started during the previous year, relative to the future water supply of Honolulu, was continued on a wider scope than previously, and many special reports thereon were furnished the Governor of Hawaii, the Honolulu Water Commission, and others interested in this problem.

The artesian well records obtained by the Department of Public Works show that, regardless of the heavy rainfall of the past year, the amounts pumped and flowing from the wells have exceeded the supply, and one more year has been deducted from the period which must surely end in a serious water shortage for the city of Honolulu, unless one of the two following courses of procedure is followed:

1. The acquirement or control of all artesian wells in the

Honolulu basin (between Fort Shafter and Diamond Head) by the Territory. (It is estimated that there are about 66 active wells in this area which are discharging, either by being pumped or flowing, about 35 million gallons per day. The total supply used by Honolulu for domestic and municipal purposes at present is about 15 million gallons per day.)

2. The acquirement, transmission, and storage of surface flow.

A small amount of work done at the request of and in coöperation with a member of the City Water Commission resulted in definitely determining that the principal source of leakage from Reservoir No. 4 in the upper Nuuanu Valley is due to a break in the outlet pipe.

A weir and continuous record measurement station was established in May in Hillebrand Glen to determine the actual run-off from this valley.

MILITARY CO-OPERATION.

An investigation of the water resources between Waialae and Makapuu Pt. was made for the U. S. military authorities. The coöoperative stream and rainfall measurement work being done in relation to the water supply of Schofield Barracks was continued during the year.

OTHER CO-OPERATIVE WORK.

The flood storage investigation being made in coöperation with the Kahuku and Laie plantations was continued. Other coöoperative work included about 70 stream and ditch measurement stations, and about 62 rainfall measurement stations on all islands. Many ditch seepage investigations were also made.

SPECIAL REPORTS TO THE GOVERNOR OF HAWAII.

Special reports were made at the request of the Governor of Hawaii relative to Honolulu's water supply, the quantities and values of Territorial waters of Kekaha, Waimea, North Wailua, South Wailua, Kapaa, and Anahola on the island of Kauai; the East Maui ditches and the Olowalu and Ukumehame streams on Maui; the Wailuku, Waiakoloa, Waipio, and several other streams and ditches in the Hamakua and Kohala districts on Hawaii.

A comprehensive report as to Territorial water values was also furnished.

WAIAHOLE TUNNEL PROJECT.

The Waiahole Water Company's project which was completed in May is the largest of its kind in Hawaii, and cost between \$2,500,000 and \$3,000,000. Its principal feature is a three-mile tunnel which pierces the Koolau range and transmits the waters

of the windward streams of Kahana, Waikane, and Waiahole to the Oahu Plantation near Pearl Harbor.

* * * * *

Your attention is invited to the appended tabulations showing the stream, ditch, and rainfall measurement stations maintained during the year.

Very respectfully,

G. K. LARRISON,
Superintendent of Hydrography.

STREAM MEASUREMENT STATIONS.

Island	Number of Regular Gaging Stations	Measurements	
		Made at miscellaneous points during fiscal year.....	Made at miscellaneous points during fiscal year.....
Kauai	26	16	14
Oahu	35	16	35
Maui	35	16	20
Hawaii	0	0	0
Total	96	71	440

DITCH MEASUREMENT STATIONS.

Island	Number of Regular Gaging Stations	Measurements	
		Made at miscellaneous points during fiscal year.....	Made at miscellaneous points during fiscal year.....
Kauai	10	15	10
Oahu	16	7	49
Maui	7	0	9
Hawaii	0	0	0
Total	33	12	145

RAINFALL MEASUREMENT STATIONS.

Number of Regular Gaging Stations		Total number of stations for which records are on file in office for the fiscal year.....	
Total number of private stations for which records are available.	45	13	15
Maintained on June 30, 1916.	29	29	29
Discontinued during fiscal year	5	5	5
Established during fiscal year.	6	6	6
Maintained on July 1, 1915.	28	28	28
Kauai	8	8	8
Oahu	5	5	5
Maui	1	1	1
Hawaii	10	10	10
Molokai	0	0	0
Kona, Hawaii	6	6	6
			62
			118

Note: a Counted twice; gages are looked after by private parties.

Division of Forestry

Honolulu, Hawaii, August 16, 1916.

Board of Commissioners of Agriculture and Forestry,
Honolulu.

Gentlemen:—I respectfully submit the following routine report of the Division of Forestry for the month of July, 1916:

ROUND TOP FOREST RESERVE.

During the month several trips were made up to Round Top, when the area of government land proposed to be set aside as a forest reserve was shown to three of the Commissioners in order to acquaint them with the land. After the approval of the project by the Board at the meeting of July 26, a notice of public hearing, to be held on August 10, was signed by the Governor.

FOREST RESERVE MATTERS.

During the month improvements at the Manoa Ranger Station, Oahu, were begun by building two small culverts, grading the short stretch of road, and by hauling some of the lumber for the ranger station house.

Forest Ranger F. B. Dodge, for the Island of Hawaii, began his duties on July 15, after he had acquainted himself in this office with the forest reserve lands on Hawaii, and had received instructions as to his duties.

Tree planting by Ranger Kaina D. Lovell on the Kealia Forest Reserve, Kauai, and fence construction on the Lualualei Forest Reserve, Oahu, and on Section A of the Olao Forest Park Reserve on Hawaii, were continued during the month.

On July 23, at the request of the Governor, I accompanied his party to the land of Waimanalo, Oahu, and looked over several land matters in that region. The strip of native forest on and below the cliffs on this land are an important asset to whatever water emanates from this region, and for this reason an investigation will soon be made with the idea of setting aside this forest land as a Territorial forest reserve.

TREE PLANTING ON MAUNA KEA.

With the idea of ascertaining the possibility of raising forest trees suitable for lumber, steps were taken during the month for the raising of trees to be planted on the slopes of Mauna Kea, Hawaii. This is a project for which an allotment has been made

and it is planned to begin the experiment first on a small scale before doing any extensive work. Through the kindness of Mr. Alfred W. Carter a small nursery has been started at Keanaekolu, and for a beginning seeds of the following timber trees have been sent up for propagation:

Himalayan cypress, *Cupressus torulosa*.

Himalayan Silver fir, *Abies webbiana*.

Norway spruce, *Picea excelsa*.

Benguet pine, *Pinus insularis*.

Seed of the first three species were received from India through the kindness of Mr. J. F. Rock, our Consulting Botanist; the seed of the Benguet pine was sent direct to this Division by Mr. A. F. Fischer, Acting Director of the Bureau of Forestry at Manila, P. I.

Respectfully submitted,

C. S. JUDD,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, Hawaii, August 7, 1916.

The Superintendent of Forestry,
Honolulu, Hawaii.

Dear Sir:—I herewith submit a report of the work done during the month of July, 1916.

Nursery.

Distribution of Plants.

	In seed boxes	In boxes transplanted	Pot grown	Total
Sold	500	...	99	599
Gratis	600	656	1256
	500	600	755	1855

Collections.

Collections on account of plants sold amounted to.....	\$ 3.25
Rent of Office building, Nursery Grounds, for May.....	35.00
Total	\$38.25

Plantation Companies and Other Corporations.

The distribution of plants under this heading amounted to 10,000 in seed boxes and 1,000 in transplant boxes.

Makiki Station.

The work at this Station has been along the lines of building up stock for the coming planting season. There are indications that a great deal of planting of trees will be undertaken when the rainy season begins. Many people are now making inquiries regarding the best trees to plant for windbreaks, firewood and other purposes.

Honolulu Watershed Planting.

The principal work done on lands in the neighborhood of Sugar Loaf and Hering Valley has been hoeing and clearing away grass and weeds from the young trees. The koa trees along the upper slopes of Sugar Loaf are well above the grass and brush and are now able to take care of themselves. The kukui trees planted on the lower slopes and bottoms of gulches are also doing well, but require continual hoeing and clearing away of grass and brush until they get high enough to take care of themselves.

Advice and Assistance.

The writer has been called upon to pay visits and otherwise to give advice and assistance as follows:

Calls made to places in and around the city.....	13
Advice by telephone.....	16
Advice by letter.....	8

37

Very respectfully,

DAVID HAUGHS,
Forest Nurseryman.

Division of Plant Inspection

Honolulu, Hawaii, July 31, 1916.

Board of Commissioners of Agriculture and Forestry,
Honolulu, Hawaii.

Gentlemen:—I respectfully submit my report of the work done by the Division of Plant Inspection for the month of July, 1916, as follows:

During the month there arrived at the port of Honolulu 38 vessels, of which 20 brought vegetable matter and 1 vessel sand. Of these vessels only two passed through the Panama Canal calling here for coal and provisions.

<i>Disposal</i>	<i>Lots</i>	<i>Parcels</i>
Passed as free from pests.....	1428	22,910
Fumigated	10	515
Burned	17	18
Returned	9	12
 Total inspected	1464	23,455

Of these shipments 23,203 packages arrived as freight, 144 packages as mail and 108 packages as baggage of passengers and immigrants.

Corn, Rice and Bean Shipments.

During the month 29,821 bags of rice arrived from Japan and 2253 bags of beans from Japan and Oriental ports, all of which were found free from weevils and grain moths.

Two lots of corn consisting of 43 bags in one lot and 500 bags in the other arrived on the 15th. As the ruling against the importation of all corn into the United States took effect on July 1st, and as these shipments had left the port of shipment before the time of enforcing the rule, I was requested to ascertain whether or not some allowance could be made in this particular case. I therefore cabled to Washington, D. C., and got a reply that the corn could not enter the Territory. Upon its arrival I found the 500-bag lot to be badly infested with weevils and ordered the same placed in the large fumigating house on Kilauea street where the shipment remained until the day when it was loaded on the Canadian steamer and shipped to British Columbia. The disease (*Sclerospora maydis*) and other closely related forms of downy mildews, for which Quarantine Notice 24 was drawn, not only attacks corn, but also all related species such as Sorghum,

Egyptian corn and Job's tears. If introduced here this disease would cause considerable loss to the farmer. The countries in which these diseases are known to exist are Southeastern Asia, Malayan Archipelago, Australia, New Zealand, Oceanica, Philippine Islands, Formosa, Japan and adjacent islands. Hereafter all corn shipments from these countries, whether as freight or small packages by mail, will be either destroyed or returned to shipper.

Pests Intercepted.

Approximately 1,840 pieces of foreign baggage were examined during the month, principally at the U. S. Immigration station, and 15 packages of fruit and one package of vegetables were found, seized and destroyed by burning.

Five pine trees and 4 ornamental plants were refused a landing from a Japanese freighter calling at this port. A package of Gladiolus bulbs was fumigated on account of the bulbs being infested with the bulb aphis. Two packages of palm seeds in the mail from India were treated with carbon bisulphide before delivery. One package containing 6 pineapple plants arrived by mail from Queensland for the Hawaii Experiment Station. These were carefully examined by Dr. Lyon and myself and were fumigated on account of the common mealybug (*Pseudococcus bromeliae*). The pineapple plants are held in quarantine under our supervision at the Hawaii Experiment Station, isolated from other plants and will remain so until we are satisfied that no disease will develop on them.

A box of Orchids from New Jersey with a few plants infested with scale (*Aspidiotus cyanophylli*), 1 fern in the mail from Ohio infested with scale (*Heinrichionaspis aspidistrae*) and (*Saissetia himisphaerica*) were fumigated before delivery. One package of dried peas in the mail infested with the pea weevil (*Bruchus pisorum*) and 2 packages of rice seeds from Japan were fumigated with carbon bisulphide before delivery. One package of tree seeds from India for the Hawaii Experiment Station, which was infested with weevils, was fumigated before delivery. One package of tree seeds and 1 package of mango seeds from Manila as well as 1 package of tree seeds from Japan were returned by the U. S. Post Office as unmailable under ruling of the Federal Horticultural Board.

HILO INSPECTION.

Brother Matthias Newell reports the arrival of 7 steamers during the month, of which 4 brought vegetable matter consisting of 176 lots and 2,338 packages, all of which was found free from pests and was passed for delivery.

Owing to the usual vacation granted to Brother Newell each

year I left Honolulu on July 8th to take charge of the work during his absence. I found his work in good shape and everybody seemed pleased. During my stay I liberated a number of the melon-fly parasites (*Opium fletcheri*) for Mr. Fullaway as I had a good opportunity to do this between steamer arrivals.

INTER-ISLAND INSPECTION.

Sixty-two steamers plying between the port of Honolulu and other island ports were attended to during the month. The following shipments were passed as free from pests:

Taro	585	bags
Plants	109	packages
Vegetables	97	"
Fruit	17	"
<hr/>		
Total passed	808	"

The following packages were refused shipment as they did not pass the regulations pertaining to soil and infestations:

Fruit	11	packages
Plants	20	"
<hr/>		
Total refused	31	"

Respectfully submitted,

E. M. EHRHORN,
Chief, Division of Plant Inspection.

Division of Entomology

Honolulu, Hawaii, July 31, 1916.

Board of Commissioners of Agriculture and Forestry,
Honolulu.

Gentlemen:—Permit me to report on the operations in the In-
society during the month of July, 1916:

On account of the large amount of work connected with the new melon-fly parasite, we have had to abandon the propagation of all of the fruit-fly and dung-fly parasites that we know to be established. We are, therefore, now running only the two pupa parasites, *Tetrastichus*, and the melon-fly *Opicus*.

During July two lots of *Tetrastichus* were liberated, one of 150 at Pearl City and another of 200 at Hana, Maui. A lot of 50 *Dirhinus* were liberated at Pearl City.

During the month of July there were produced 1485 female and 674 male individuals of the new melon-fly parasite, *Opicus fletcheri*. Liberations were as follows:

Pearl City	31
Manoa	86
King and Kalakaua	169
Moiliili	310
Kailua	123
Waialua	64
Hilo	267
Kapoho	132
Molokai	150
Hana	68
Wailuku	121
Lihue	138
Koloa	59

1718

On the last day of the month Mr. Herbert Osborn of the Hawaiian Sugar Planters' Association staff arrived from Manila with the egg parasite of the corn leaf-hopper mentioned in a recent report to the Board. As the new quarantine room at this station offered the securest place for handling these parasites, and as Mr. Osborn's time was largely preempted by caring for other parasites more directly connected with the work of the sugar planters, the leaf-hopper parasites were brought to this station and the writer is assisting Mr. Osborn in taking care of their

propagation and distribution. In the next report the details of this work can be given and very likely some definite word as to the establishment of the parasite.

Very truly yours,

DAVID T. FULLAWAY,
Entomologist.

REPORT OF D. T. FULLAWAY: SEARCH FOR MELON
FLY PARASITES.

Honolulu, Hawaii, June 20, 1916.

Board of Commissioners of Agriculture and Forestry,
Honolulu.

Gentlemen:—Permit me to report my return, on May 10, with a small lot of *Opium fletcheri*, a parasitic wasp living at the expense of the melon fly and behaving in much the same way as the braconid fruit fly parasites obtained in Africa and Australia. An effort was made immediately to multiply the parasites in order to secure their establishment in the Islands, and it is gratifying to be able to state that in all probability we will be successful in this endeavor, as the parasites in the first generation multiplied sixfold, and the succeeding generation now coming on should provide material for liberation. At the end of fifteen days' rearing, to safeguard the introduction, the four remaining females of the original lot were taken to Kona and liberated in a particularly favorable spot among wild Chinese cucumbers.

Before going on to the detailed account of the expedition, it should be stated that when the search for melon fly parasites was begun last July, our knowledge of the fly outside of Hawaii was very limited, consisting almost wholly of the probable distribution of the fly gained from the meager records of Compere and Muir and the publications of the Imperial Entomologist of India. Nothing positive was known of parasites, although Muir's accounts of the relative scarcity of the fly in certain localities gave a measure of confidence to the assumption that parasites existed.

In regard of the facilities offered by the government laboratories in India, it was considered that it would be the country to work first, and on July 23 I set out with the intention of going directly to Pusa in India. When I reached Manila, however, I went up to Los Baños to have a conference with Muir, and it was largely on his recommendation that I decided to work first around Singapore.

While at Hongkong, August 17-20, on my way to Singapore, I made a short trip up the river to Macao, where Muir and Ker-

shaw had worked considerably, to determine its suitability as a breeding station on my probable return with parasites.

Leaving Hongkong on the 20th, I arrived at Singapore on the 26th, located a supply of infested fruit in some Chinese vegetable gardens, and set up my laboratory in a room over the hotel garage. Here I worked over a month, rearing melon flies out of cucumbers and a few momordicas and luffas. At the end of a week on opening some of the puparia, I found a single female Opius, and shortly after two males, and felt encouraged to go on. However, although more than 6,000 flies were reared, no further parasites were obtained, and I decided to continue on my way to India. I attribute the meagre results obtained in Singapore to the character of the fruit used, and the manner of its cultivation. The only cultivated cucurbit to be obtained in any quantity is the cucumber, which is produced by Chinese market gardeners under conditions which are very favorable to mold—the ground where these gardens are is low, and it is the custom of the Chinese to wet down the beds three or four times a day with liquid manures. I think if wild momordicas could have been obtained, the parasites would have been more abundant, but under the conditions described, the parasites have little chance to multiply.

At Singapore I had the misfortune to lose part of my equipment and I utilized the time necessary to have it replaced in investigating melon fly conditions in Java. It is only a 36-hour run from Singapore to Batavia, and another 3-hour journey on the railroad to Buitenzorg, the seat of government and location of the scientific laboratories. The director of the scientific work, Dr. Konigsberger, showed sympathetic interest in my mission, and kindly offered me a desk in the Strangers' Laboratory. I spent nearly a month in Java, October 10 to November 6, and in this time reared between 4,000 and 5,000 flies. In due course the material disclosed the parasite found at Singapore, and I was able to take a small lot of males and females away with me. My time in Java was limited, and the work done there was done too hurriedly to give anything more than an impression of the conditions, but the impression was very favorable. Cultivated fruit was scarce at that season of the year, and momordicas were used very largely in rearing flies. These fruits are not cultivated in fields or gardens, but are grown by the natives around their houses, and are, therefore, very much scattered. The cultivated fields appeared clean, and I was told that two pickings are usually secured before an infestation is noticed. A large ground beetle was very active here.

On returning to Singapore, I found a letter from Muir giving encouraging information in regard to the Philippines, but I had already made my plans to go to India, and was obliged to defer the investigation of this new field till later.

Leaving Singapore on the 9th of November, we arrived at Negapatam on the 16th, and from there I proceeded by rail to Bangalore, in Mysore State, a locality highly recommended by Compere. I may say that the idea of going to Pusa had to be abandoned on account of the low temperatures prevailing there during the winter months. I found Bangalore suited to my purposes, although it is not, as I had expected it to be, in a rich agricultural or fruit-growing section; it is really one of the hill stations of India, in normal times with a garrison of more than 10,000 troops, and on account of its fine climate, has attracted many Indian pensioners. It was natural, therefore, to find on the outskirts of the city extensive gardens, and my first examination of these revealed the melon fly. I utilized a small room in the hotel as a laboratory, and was soon rearing hundreds of flies. Before I had a chance to breed the parasites brought from Java, the same species appeared in Indian material, and in a very short time I had a flourishing colony. I spent five weeks or more in India, rearing about 10,000 flies. Out of these *Opis fletcheri* came abundantly, and I was also able to cultivate a small lot of *Spalangias*; but nothing further appeared, and after my own extensive work and the assurance of Mr. Fletcher, the Imperial Entomologist, that nothing else had ever been bred by them from *D. cucurbitae*, I decided I had exhausted this field and it was time to move on to the Philippines. All the while in India I was looking closely for *Syntomosphyrum indicum*, the fruit fly parasite introduced by Compere into Australia, by Lounsbury into the Cape, and by Silvestri into Italy, but I saw nothing of it, and the Indian Entomologist could give me no information about it beyond what I already knew.

Leaving Bangalore on the night of December 23 for Colombo, I was detained by the Indian police at Dhanuskodi for three days *en route*, but arrived in ample time to catch the Spanish mail December 31, and after an uneventful voyage of 18 days reached Manila with about 75 living examples of the Indian parasite, *Opis fletcheri*, which I had carried with me on leaving India. While stopping in Singapore I had also secured infested fruit to breed the parasites *en route*, and from this material I subsequently got 64 additional individuals.

In Manila I received very generous assistance from the Bureau of Agriculture and Science, and established a laboratory in a room set aside for me at the latter institution. I found fruit very scarce and practically no cultivated cucurbits. Under the circumstances I was obliged to depend entirely for rearing and breeding purposes on momordicas. These fruits are dry and do not give the same trouble with regard to mold that cucumbers do; at the same time they contain very few maggots, and are got only with great exertion and loss of time. As a consequence my stock of parasites dwindled, and I was disappointed in the hope

of finding additional species. I spent nearly three months in the Philippines, rearing about 18,000 flies, but nothing new disclosed itself. This seemed strange in view of the rich fruit-fly fauna there, which is known to harbor several species of opine parasites. I also lost the small colony of *Spalangia*, one generation running to males.

While in Manila, Mr. Osborne of the Planters' staff, called my attention to the heavy parasitism suffered by the corn leaf-hopper in the Philippines. One particular parasite, a Mymarid, seemed especially effective, and I undertook to introduce it into Hawaii, keeping a well-stocked cage of it going for a month before my departure. It was unfortunate that at the time of leaving Manila, the steamer connections were such that I was obliged to remain in Hongkong a week. I used this intermission in the voyage to the best advantage, but my fruit-fly parasites had dwindled to very small proportions by the time of my arrival in Honolulu, and the leaf-hopper material went utterly bad before getting as far as Shanghai. It was really too early in the season to bring corn plants through. This parasite and another chalcid, which is known to parasitize the corn hopper, should ultimately be brought here, as in the Philippines they prove an effective check on the hopper.

As previously stated, since reaching Honolulu the melon fly parasites have multiplied, and the introduction is practically assured, but the original task of finding enemies of the melon fly which will prove an effective control of the pest, is far from accomplished. Before making further recommendations, it is necessary to study the problem thoroughly from several different angles, and it is probable that the advice of Professor Silvestri and other specialists would give more light on the nature of the work and the best methods for its accomplishment.

Very respectfully,

D. T. FULLAWAY,
Field Entomologist.

Division of Animal Industry

Honolulu, Hawaii, August 21, 1916.

Board of Commissioners of Agriculture and Forestry,
Honolulu.

Gentlemen:—I have the honor to submit the following report for the Division of Animal Industry for July, 1916:

SORE-HEAD OR CHICKEN POX.

The demand for sore-head vaccine continued to increase, more than two thousand doses being distributed or applied to infected flocks during the month, with highly satisfactory results. This method of treatment may now be accepted as safe and effective with all classes of chickens more than four to five weeks old. Such young birds do not seem to have the resistance or vitality required for the treatment, in fact, they seem to benefit little, if at all, from it. The point is, therefore, to guard the chicks against infection and this can easily be done by keeping them in brooders or boxes raised above the ground. So long as such young birds are not turned out on infected ground they will not easily develop the disease, and if one or more should show symptoms, it will be noticed at once and quick removal will protect the rest, as the disease does not seem to be very contagious until the scabs are ready to drop from the sores.

A visit to the splendid Minorca breeding plant of Mr. H. F. Fisher, near Olaa, Hawaii, is proof sufficient of the value of sore-head vaccination. It will be remembered from former reports, that Mr. Fisher last year lost more than one hundred pullets in less than two weeks, and that he felt convinced he would have lost practically all of the remaining 200, had it not been for the timely application of the vaccine. Mr. Fisher recently was kind enough to place at my disposal 100 head of culls for experimental purposes. These birds had not been vaccinated and, unfortunately, the disease broke out among them in a most virulent form so that upon my arrival at Olaa only forty remained alive, and at least half of these were so badly affected as to make them useless for the planned experiments. Among these birds the lesions were, for the first time, observed on both wings and shanks, besides the usual location on head and necks. About twenty-five of the forty survivors were saved by ordinary double vaccination, which, considering the unusual malignant form the disease had assumed must be considered a very good percentage. What would have happened to Mr. Fisher's poultry enterprise, except for the vaccine which had been applied to all of his sev-

eral hundred purebred birds before the disease made its appearance this spring, is not pleasant to contemplate. As it is, Mr. Fisher is now on the way to the Coast to purchase five hundred additional birds, sore-head notwithstanding.

KIDNEY WORM IN HOGS.

While in Hilo an opportunity to investigate the circumstances surrounding the fatal outbreak of kidney worm, reported by Dr. Elliot last month, offered itself. That this disease is not confined to hogs kept on slaughter house offal and in highly unsanitary conditions, was fully proven. The parasite was, in fact, encountered in hogs living under ideal conditions, that is, the wild or half-wild hogs which roam by the thousand on the upper slopes of Mauna Kea. Without exception, every hog killed on the south side of the Puu Oo hill and the upper branch of the Wailuku River appear to be more or less infected with the worms, and the possibility of the infection reaching Hilo by means of the river is not excluded. Live hogs cannot be transported from this remote vicinity to the lowlands except on pack mules, which, of course, is not done; but as the Wailuku River has its origin on the Puu Oo divide, where the infected hogs were seen in at least one of its branches in large numbers, and where post-mortems were made and the worms found, the conclusion seems justified that the heavy infestation of the hogs at the slaughter house near Hilo may have originated on the upper reaches of Mauna Kea.

The life history of this worm is not known. It infests the abdominal viscera of hogs and is most frequently found in the kidney fat, or in the kidney itself, and more rarely in the liver and other organs. In one case at least, nearly half of one kidney was found transformed into abscesses and cysts which, upon isolation, showed numerous worms in various stages of development. That some part of the worm's life cycle is spent outside the hogs, is undisputed, and that some other host (possibly the earth worm) assists in the development of the parasite, is highly probable, but beyond these surmises nothing is known, not even the manner in which the infection (eggs or larva) leave the original host.

In the meantime it is futile to suggest measures for the control of the parasite beyond the boiling of all slaughter house offal, while medicinal treatment is absolutely excluded, owing to the habitat of the worms in organs and tissues inaccessible to ordinary treatment.

FORAGE POISONING OF HOGS ON MAUI.

From the appended report of the Assistant Territorial Veterinarian, it will be seen that a number of hogs were lost on Maui as a result of feeding badly moulded corn. This is one of the

first cases recorded of hogs succumbing to the so-called cerebro-spinal meningitis, and proves that it is not always safe to feed grain which has caused the death of horses and mules, to hogs, a method often resorted to in order to save the total loss of badly harvested feed. As a rule hogs will do well on grain or other forage which is sure death to horses, but it stands to reason that there must be some limit, which indeed seems to have been reached in this case. Whether such badly spoiled feed can be rendered innocuous by boiling, must be proven in each case and should not be taken for granted. The poisons produced in the grain by certain moulds and fungi do not necessarily change their chemical composition or properties even when the fungus or mould has been killed by moist heat, and caution is therefore advisable in all cases where the use or disposal of mouldy feed is considered.

QUARANTINE STATION.

An unusually large number of dogs have arrived here of late, so many in fact, that all the kennels in the dog division are full, and several have more than one occupant. As I am apprised of the arrival of several more dogs in the near future, it seems to me advisable that the station be enlarged to meet the requirements. The continued demand for mosquito proof kennels for toy and pet dogs belonging to tourists or temporary visitors, also makes it desirable that such quarters be provided. A tentative plan and estimated cost have been submitted to the Executive Officer of the Board.

Very respectfully,

VICTOR A. NORGAARD,
Territorial Veterinarian.

REPORT OF ASSISTANT VETERINARIAN.

Honolulu, Hawaii, August 17, 1916.

Dr. Victor A. Nörgaard,
Chief of Division of Animal Industry,
Board of Agriculture and Forestry,
Honolulu.

Sir:—I beg to submit the following report for the month of July, 1916:

Tuberculosis Control.

The following dairy cattle were tested during the past month:

	Tested	Passed	Condemned
John Gomes	71	69	2
Chas. Frazier	8	8	0
Salvation Army Home.....	7	7	0
W. P. Alexander.....	4	4	0
K. Mitsuwaga	4	4	0
Kawaiahao Seminary	22	21	1
Sam Kanakanui.....	5	5	0
Kualoa Ranch.....	389	387	2

From the above list it will be seen that 510 cattle were tested, out of which number 505 were passed and 5 condemned and branded. All of the above condemned cows have been slaughtered.

Post-Mortem Examinations.

Cow condemned July 17: slaughtered at C. Q. Yee Hop's abattoir: Lesions: small recent nodule in one mediastinal gland.

Chicken-pox or Sorehead.

During the past month 2450 c.c. of chicken-pox vaccine has been prepared and used among the flocks of the City and County with most excellent results.

It has been found by experiment that the least amount of carbolic acid which will preserve the vaccine is 1 per cent. This percentage, apparently, will keep the vaccine indefinitely and so far no detrimental effects have been observed.

Food Poisoning on Maui.

In response to a wireless from Dr. J. C. Fitzgerald, and at the direction of the President and Executive Officer of the Board, I left for Maui to investigate a peculiar condition among hogs on the Haleakala Ranch.

History: The herd consisted of about sixty-five head, large and small. For the past few weeks previous to my arrival, several hogs had died, symptoms before death resembling hog cholera. Dr. Fitzgerald administered large doses of anti-hog cholera serum without results, as deaths still continued to occur.

Symptoms: The symptoms as observed were, in the first stages, high fever, rapid breathing, all food refused, a disinclination to get up, and when aroused, a weak staggering gait; in the final stages, complete paralysis of hind parts with more or less complete paralysis of the larynx and pharynx, and not being able to swallow the saliva drooled from the mouth, and in a short time death would take place. At no time were any red spots

observed on the surface of the body, as in hog cholera. There was no regular space of time between first appearance of symptoms and death, some of the younger pigs—four to five months—died in a day or two, the old sows lingered along for four or five days or a week.

Post-Mortem Examination.

Upon my arrival I went at once to the ranch with Dr. Fitzgerald and two post-mortems were made; one on a sixty or seventy-pound pig which had died the night before and one of similar size which we found in a dying condition. In these two animals there wasn't a lesion of any kind. No evidence of hog cholera, or any abnormal condition in any of the internal organs. The only thing noticed was that the kidneys were somewhat paler than usual, due perhaps to the fever.

An inspection of the remaining animals in the pens revealed five more sick ones. A large part of the healthy ones had been removed by Dr. Fitzgerald to new quarters, and a complete change of diet ordered, and with the exception of one sow, which was taken sick just after removal, no symptoms appeared or deaths occurred among this number segregated.

It was decided to allow a few days to elapse so as to give an opportunity for lesions to develop in those sick. Consequently, on the following Monday five hogs, in a now dying condition, were killed and careful post-mortem examinations made. The results were, as in the other two, no lesions of any kind throughout the entire thoracic and abdominal viscera.

Upon opening the brain it was found that there was a slight thickening of the covering membranes which were more adherent to the cranial cavity than normally. The brain itself was very much congested. There was a slight increase of the ventricular fluid, and the floor of the fourth ventricle was exceedingly congested. The membranes of the spinal cord were thickened and congested.

Diagnosis. The above outlined symptoms and post-mortem findings strongly suggested a forage poisoning of some kind, and with that idea in view we carefully examined all the feed. The diet consisted of wheat middlings, cane tops and molasses and corn on the cob. Everything was found in excellent condition but the corn. This corn had been purchased by the ranch some time before and was not properly cured in the first place, and was now permeated throughout with all kinds of mould. Not only were the cobs mouldy, but individual kernels could be easily broken and shown to be filled with a green powdery mould. This serious condition of the corn, which was absolutely unfit for food, together with the fact that no sickness occurred among those hogs segregated and to which no corn was given, would seem to in-

dicate that this particular portion of the diet was responsible for all the loss which had occurred.

Dr. Fitzgerald's tentative diagnosis of a form of cerebro spinal meningitis or forage poisoning would seem to be fully established by the above symptoms, post-mortem findings and condition of the feed.

Prevention: Complete change of location and, as far as possible, complete change of diet and strict attention to the condition of the feed used.

Importation of Live Stock.

S. S. Wilhelmina, San Francisco—12 cts. poultry.

S. S. Manoa, San Francisco—1 dog, Capt. J. W. Crawford; 22 cts. poultry.

S. S. Niagara, Vancouver—1 dog, Mrs. Richardson-Jones.

S. S. Matsonia, San Francisco—1 dog, Mrs. de Temple; 1 dog, W. F. Ex. Co., 32 cts. poultry.

S. S. Lurline, San Francisco—44 mules, Schuman Carriage Co.; 1 Hampshire sow, J. H. Wilson; 35 cts. poultry.

Respectfully submitted,

LEONARD N. CASE,
Assistant Territorial Veterinarian.

Division of Hydrography

Honolulu, Hawaii, August 9, 1916.

Board of Commissioners of Agriculture and Forestry,
Honolulu, T. H.

Gentlemen:—The following report of operations of the Division of Hydrography during July, 1916, is submitted:

WEATHER CONDITIONS.

With the exception of the third week in the month, during which abundant heavy showers fell on Hawaii, Oahu, and part of Maui, the month was one of light rainfall. Frequent light showers kept vegetation in good condition, but generally streams and ditches are drawing down to a very low flow. Flood storage reservoirs generally contain very little water. No. 4 Reservoir of the City of Honolulu on July 31 had but 26 feet of water in it.

KAUAI FLOOD STORAGE RECONNAISSANCE.

The upper valleys of the North Wailua, Kapaa, and Anahola basins were visited and several possible flood storage reservoir sites worthy of further investigation were found at elevations of from 400 to 700 feet above sea level.

A similar investigation will be made in the headwaters of the Waimea River in September.

TERRITORIAL WATER COMMISSION WORK.

The services of Assistant Engineers R. C. Rice and R. D. Klise during the month were entirely devoted to work for the Territorial Water Commission. A considerable part of the time of the Superintendent, who is chairman of this commission, was also expended on this work.

OPERATION AND MAINTENANCE WORK.

Kauai. Ten days were spent in collecting and checking coöperative ditch run-off and rainfall records for the fiscal year ending June 30, 1916.

The Lumahai River measurement station was overhauled and repaired.

A new coöperative ditch measurement station was established on the Kuna ditch near Hanalei.

Thirty-six stream and ditch, 17 rainfall, and 5 evaporation

measurement stations were visited. Twenty-two stream and ditch discharge measurements were made.

Oahu. Eighteen stream and ditch and 3 rainfall measurement stations were visited and 5 discharge measurements were made.

Maui. Five days were spent collecting coöperative ditch discharge and rainfall data.

Thirty-one stream and ditch and one rainfall measurement stations were visited and 21 discharge measurements were made.

Very respectfully,

G. K. LARRISON,
Superintendent of Hydrography.

BY AUTHORITY.

PROCLAMATION OF FOREST RESERVE IN THE DISTRICT OF HONOLULU, ISLAND OF OAHU, TERRITORY OF HAWAII.

Under and by virtue of the authority vested in me by the provisions of Chapter 37 of the Revised Laws of Hawaii of 1915, and of every other power me hereunto enabling, I, LUCIUS E. PINKHAM, Governor of Hawaii, with the approval of a majority of the Board of Commissioners of Agriculture and Forestry, having held the hearing of which notice has been duly given as in said laws provided, do hereby set apart as a forest reserve to be called the ROUND TOP FOREST RESERVE, subject to existing rights, a portion of that certain piece of government land called Makiki in the District of Honolulu, City and County of Honolulu, Island of Oahu, Territory of Hawaii, containing a net area of 115 acres, more or less, more particularly described by and on maps made by the Government Survey Department of the Territory of Hawaii, which said maps are now on file in the said Survey Department marked Government Survey Reg. Map No. 2521, and "Round Top Forest Reserve" and a description accompanying the same numbered C. S. F. No. 2628, which said description now on file in said Survey Department is as follows:

ROUND TOP FOREST RESERVE,
Honolulu, Oahu.

Beginning at a U. S. Military Reservation monument at the north corner of this land, said monument being by true azimuth and distance $48^{\circ} 00'$, 231.2 feet from the Government Survey Trig. Station "Kakea," and running by true azimuths:

1. Southwesterly along top of ridge along Makiki Park and Reservation to a pipe, the direct azimuth and distance being: $27^{\circ} 27'$ 1059.0 feet;
3. $47^{\circ} 47'$ 1249.0 feet along Makiki Park and Reservation to a pipe;
3. $47^{\circ} 47'$ 1240.0 feet along Makiki Park and Reservation to a pipe;
4. $40^{\circ} 58'$ 1293.5 feet along Makiki Park and Reservation to a point on the upper side of Round Top Drive, said point being $220^{\circ} 58'$ 69.5 feet from a pipe at the North corner of Lot 825 of Makiki-Round Top Lots;
5. Thence along the upper side of Round Top Drive along a curve to the left with radius of 112.0 feet, the direct azimuth and distance being: $337^{\circ} 52'$ 106.6 feet;
6. $309^{\circ} 27'$ 280.1 feet along upper side of Round Top Drive;
7. $299^{\circ} 27'$ 88.6 feet along upper side of Round Top Drive;

8. Thence still along upper side of Round Top Drive on a curve to the right with radius 534.0 feet, the direct azimuth and distance being: $310^{\circ} 47'$ 209.9 feet;
9. $322^{\circ} 07'$ 116.6 feet along upper side of Round Top Drive;
10. Thence still along upper side of Round Top Drive on a curve to the left with a radius of 215.0 feet, the direct azimuth and distance being: $279^{\circ} 43'$ 290.0 feet;
11. $237^{\circ} 19'$ 70.8 feet along upper side of Round Top Drive, the true azimuth and distance from this point to the Northeast corner of Lot 820 of Makiki-Round Top Lots being: $327^{\circ} 19'$ 50.0 feet;
12. Thence still along upper side of Round Top Drive to a $1\frac{1}{2}$ inch pipe, the direct azimuth and distance being: $230^{\circ} 43'$ 2787.6 feet;
13. $226^{\circ} 30'$ 554.0 feet to a $1\frac{1}{2}$ inch pipe;
14. $142^{\circ} 35'$ 38.0 feet along Land Court Petition 157 to a 2-inch pipe;
15. $225^{\circ} 00'$ 164.0 feet along Land Court Petition No. 157;
16. $216^{\circ} 36'$ 148.0 feet along Land Court Petition No. 157;
17. $197^{\circ} 10'$ 65.8 feet to a 2-inch pipe;
18. $214^{\circ} 14'$ 167.6 feet along Land Court Petition No. 152;
19. $200^{\circ} 18'$ 163.2 feet along Land Court Petition No. 152 to a 2-inch pipe;
20. $201^{\circ} 41'$ 182.6 feet;
21. $120^{\circ} 00'$ 100.0 feet;
22. $165^{\circ} 50'$ 330.4 feet;
23. $166^{\circ} 24'$ 40.1 feet across road;
24. $141^{\circ} 05'$ 124.5 feet along 20-foot U. S. Military right-of-way;
25. $124^{\circ} 55'$ 222.6 feet along 20-foot U. S. Military right-of-way;
26. $105^{\circ} 00'$ 158.3 feet along same;
27. $76^{\circ} 29'$ 150.2 feet along U. S. Military Reservation to a U. S. monument;
28. $92^{\circ} 45'$ 159.0 feet along U. S. Military Reservation to a U. S. monument;
29. $147^{\circ} 37'$ 90.0 feet along U. S. Military Reservation to the point of beginning.

Area 118 90-100 Acres.

Excepting and excluding therefrom, however, the U. S. Military Reservation on Round Top Hill and 20-foot right-of-way thereto, as described in War Department General Order No. 200, dated December 10, 1908, (area 3.9 acres), LEAVING A NET AREA OF 115.00 ACRES.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the Great Seal of the Territory of Hawaii to be affixed.

DONE at the Capitol in Honolulu, this 10th day of August, A. D. 1916.
 (Signed) LUCIUS E. PINKHAM,
 Governor of Hawaii.

TERRITORY OF HAWAII

BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY

RULE IX

DIVISION OF ANIMAL INDUSTRY

Rule and Regulation of the Board of Commissioners of Agriculture and Forestry Concerning Hog Cholera and Other Diseases of Swine.

In order to prevent the spread of hog cholera, swine plague, contagious pneumonia and other infectious, contagious, and communicable diseases

of swine, the Board of Commissioners of Agriculture and Forestry of the Territory of Hawaii hereby makes the following rule and regulation:

Sec. 1. It shall be the duty of the owner, agent, keeper, or other person in charge of or in any way connected with the keep or care of swine, to report, without delay, to the Territorial Veterinarian, his Assistants or Deputies, the appearance among such animals of any disease or symptoms of disease which he knows or has reason to believe is of infectious, contagious or communicable nature.

Sec. 2. Pending the arrival of the Territorial Veterinarian, his Assistant or Deputy, said owner, keeper, or person in charge shall immediately segregate the sick or suspicious animals, preferably, if possible, by removing the unaffected animals to a safe distance on higher ground and to the windward of the diseased animals, and shall take every possible precaution to prevent the further spread of the disease to either his own or his neighbors' animals.

Sec. 3. Animals which have died shall, if conditions permit, be kept for a reasonable time in order to aid the veterinarian in diagnosing the disease, but the carcasses must be removed to a place on low ground convenient for burial, and be covered with sacks saturated in a five per cent solution of carbolic acid, creolin or other strong disinfectant, or with lime. A grave five feet deep shall be dug or firewood provided for the immediate disposal of the carcasses after examination.

Sec. 4. All dogs, cats, poultry and, so far as possible, mynah birds and other scavengers shall be kept away from the carcasses of dead animals and the infected premises.

Sec. 5. No visitors shall be allowed on or near the infected premises, nor shall the owner, keeper, or any other person leave the same without first cleaning and disinfecting his shoes and hands and removing or exchanging contaminated garments.

Sec. 6. Until a definite diagnosis has been made by the Territorial Veterinarian, his Assistant or Deputy, and definite instructions issued by him, no hogs shall be allowed to leave the premises. The same applies to all litter and manure, as well as to stable and farm utensils which have been used on or near the infected premises. The hoofs of driving or riding animals and the wheels of wagons, trucks or automobiles shall be washed and disinfected before leaving the same.

Sec. 7. Upon the arrival of the Territorial Veterinarian, his Assistant or Deputy, the owner, keeper or person in charge shall assist him in investigating the nature, cause and origin of the disease to the best of his ability, and shall coöperate with him in suppressing and eradicating the infection. If necessary, in the judgment of the Territorial Veterinarian, his Assistant or Deputy, he will declare a quarantine upon the infected premises and will issue such instructions as in his judgment are required to make the same effective. All such instructions that pertain to segregation, destruction or disposal of animals diseased beyond recovery or dead, disposal of manure and infected bedding, disinfection and whitewashing, testing and inspection of diseased or exposed animals must be complied with implicitly. In regard to the treatment of the diseased and exposed animals the owner, keeper or person in charge may call into consultation or employ any veterinarian licensed to practise under the laws of the Territory, or may treat or vaccinate his own animals, so long as such consultation, treatment or vaccination meets with the approval of the Territorial Veterinarian, his Assistant or Deputy and does not conflict with the policies of the Board of Agriculture and Forestry or with the laws of the Territory.

Sec. 8. The appended order of quarantine shall become effective immediately upon its promulgation by the Territorial Veterinarian, his Assistant or Deputy, and as soon as detached, delivered to and receipted for by the owner or manager of the infected premises, specified therein.

Sec. 9. When quarantine has been established by such order, it shall remain in effect until revoked in writing, and no permit to remove any or all of the animals or articles specified in the quarantine order shall become effective until issued in writing by the Territorial Veterinarian, his Assistant or Deputy.

Sec. 10. Immediately upon the establishment of quarantine the premises shall be posted conspicuously by means of suitable placards and the same shall remain in place until removed by the Territorial Veterinarian, his Assistant or Deputy, or by his order.

This rule shall take effect on the first day of September, 1916.

Approved this eighth day of August, 1916.

LUCIUS E. PINKHAM,

Governor of Hawaii.

Any violation of this regulation is a misdemeanor and punishable by a fine not to exceed \$500.00. (See Sec. 529, Revised Laws of Hawaii of 1915.)

TERRITORY OF HAWAII

BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY

Further amendment to Rule XVIII of the Division of Entomology of the Board of Commissioners of Agriculture and Forestry concerning the Control of Fungus Diseases on Pineapples.

The Board of Commissioners of Agriculture and Forestry of the Territory of Hawaii hereby further amends Rule XVIII of the Division of Entomology concerning the control of fungus diseases on pineapples in order to permit the shipment of pineapple fruit only from Honolulu to ports on the Island of Hawaii so that the said rule shall read as follows:

The Board of Commissioners of Agriculture and Forestry of the Territory of Hawaii hereby makes the following rule and regulation for the purpose of preventing the spread of a fungus disease upon pineapples which has made its appearance upon the Islands of Kauai and Oahu:

Section 1. All persons and corporations are hereby prohibited from carrying, transporting, or shipping from the Islands of Kauai and Oahu to any other Island in this Territory any pineapple fruit, pineapple plant, or pineapple sucker; provided, however, that clean pineapple fruit may be shipped from Honolulu to ports on the Island of Hawaii.

Section 2. No pineapple fruit, pineapple plant, or pineapple sucker shipped from any port of the Islands of Kauai and Oahu to any other port in this Territory, excepting clean pineapple fruit shipped from Honolulu to ports on the Island of Hawaii shall be allowed to be landed. Inspectors and other duly appointed agents of the Board of Agriculture and Forestry are hereby empowered to examine and inspect all freight, baggage, and belongings arriving at any port of the Territory from the Islands of Kauai and Oahu and to destroy any and all pineapple fruits, plants or suckers, excepting clean pineapple fruit arriving at ports on the Island of Hawaii from Honolulu, found among such freight, baggage or belongings.

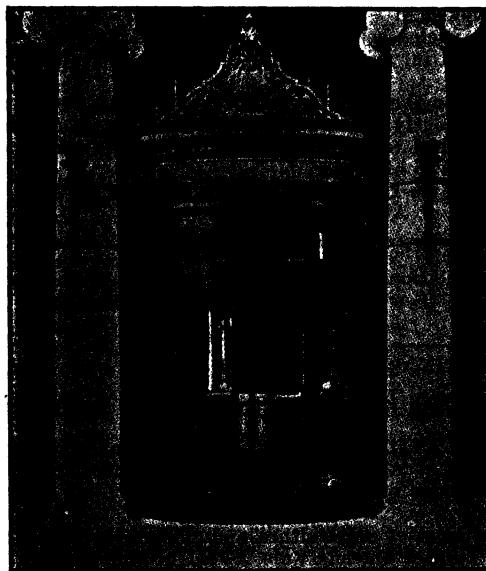
Section 3. Any person violating the above rule shall be guilty of a misdemeanor and upon conviction thereof shall be punished by a fine not to exceed Five Hundred (\$500.00) Dollars as provided by Section 529 of the Revised Laws of Hawaii of 1915.

Section 4. This Rule, as amended, shall take effect upon its approval by the Governor.

Approved this 2nd day of September, 1916.

LUCIUS E. PINKHAM,

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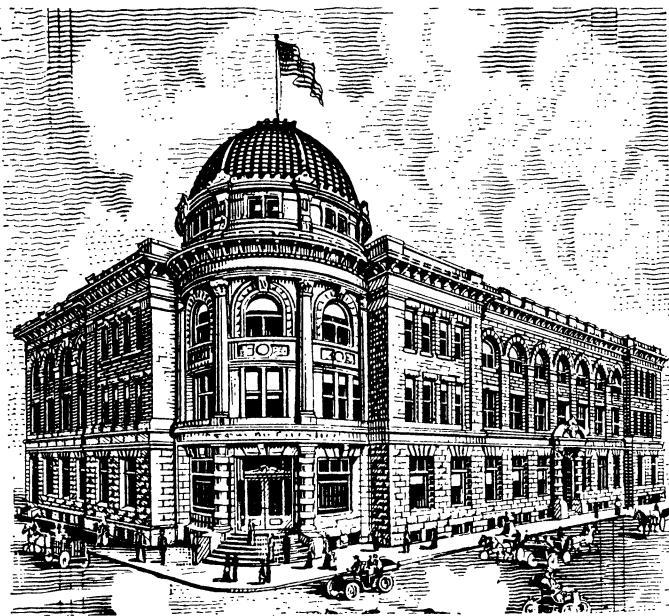
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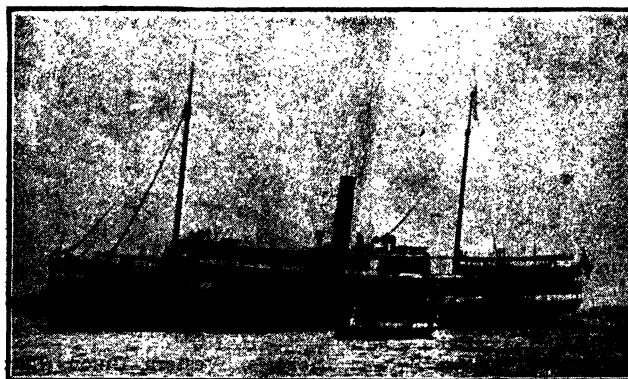
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